الفرقة الثانية
ميكانيكا - قوى
٢٠١٣/٢٠١٢

Tanta University

Department: Mechanical power Engineering
Total Marks: 75 Marks

Faculty of Engineering

Course Title: Thermodynamics (2)
Date: Jan 17th 2013 (First term)
Course Code: MEP2104
Allowed time: 3 hrs
Year: 2nd
No. of Pages: (2)

Remarks: (answer the following questions; assume any missing data, steam tables and charts are allowed)

Problem number (1) (15 Marks)

a) Explain the two statements of the second law of thermodynamics? **(4 Marks)**

b) Define the coefficient of performance of a refrigerator. Can it be greater than one? **(4 Marks)**

c) An engine operating on the Carnot cycle between the temperature limits 500 K and 350 K receives 1000 kJ of heat and the heat rejected is delivered to a building for heating purpose. The work from these engines drives a heat pump operating on the reversed Carnot cycle between the temperature limits 225 K and 330 K and the rejected heat is delivered to the same building. Calculate the total amount of heat which delivered to the building. **(7 Marks)**

Problem number (2) (15 Marks)

a) What three different mechanisms can cause the entropy of a control volume to change? **(4 Marks)**

b) Is a process that is reversible and adiabatic necessarily isentropic? Explain. **(4 Marks)**

c) One kilogram of liquid water is heated from 20 °C to 90 °C. Calculate the entropy change, assuming constant specific heat, and compare the result with that found when using the steam tables. **(7 Marks)**

Problem number (3) (15 Marks)

a) Plot reversed Brayton, Stirling and Ericsson cycles on P-V and T-S diagrams? **(4 Marks)**

b) Do diesel or gasoline engine operate at higher compression ratios? Why? **(4 Marks)**

c) An air standard Otto cycle has a compression ratio of 8. The pressure and temperature at the beginning of compression are 1 bar and 27 ° C respectively. The heat transfer to the air per cycle is 1600 kJ/kg of air, Determine the following: (1) the pressure and temperature at each corner of the cycle. (2) The thermal efficiency of the cycle. (3) The mean effective pressure of the cycle. **(7 Marks)**

P.T.O.

Problem number (4) **(15 Marks)**

a) How can we increase the efficiency of Brayton cycle **(4 Marks)**

b) Why is the Carnot cycle not a realistic model for steam power plants? **(4 Marks)**

c) A freezer is maintained at -7 °C by removing heat from it at a rate of 80 kJ/ min. The power input to the freezer is 0.5 kW, and the surrounding air is at 25 °C. Determine (1) the reversible power, (2) the irreversibility, and (3) the second-law efficiency of the freezer. **(7 Marks)**

Problem number (5) **(15 Marks)**

a) Explain Linde-Hampson system for liquefying gases? **(4 Marks)**

b) What is cascade refrigeration system? What are the advantages of it? **(4 Marks)**

c) Consider a steam power plant operating on the ideal reheat Rankine cycle. Steam enters the high-pressure turbine at 15 MPa and 600 °C and is condensed in the condenser at a pressure of 10 kPa. If the moisture content of the steam at the exit of the low-pressure turbine is not to exceed 9.0 percent, determine (a) the pressure at which the steam should be reheated (b) the thermal efficiency of the cycle, assume the steam is reheated to the inlet temperature of the high-pressure turbine. **(7 Marks)**

With my best wishes

Tanta University

Department: Physics and Engineering Mathematics
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Engineering Mathematics 3
Date: Jan 10 2013(Mechanical Power Eng.)

Course Code: PME2113
Allowed time: 3 hrs

Year: 2nd
No. of Pages: (1)

Remarks: (answer the following problems… assume any missing data… answers should be supported by sketches)

Problem number (1) (20 Marks)

a) Determine the roots of $z^4+1=0$. 5 Marks

b) Find the image of the line $\operatorname{Re}(z)=1$ under $f(z)=z^2$. 5 Marks

c) Find all values of z such that 1) $e^z=\sqrt{3}+i$ 2) $\cos z=10$ 5 Marks

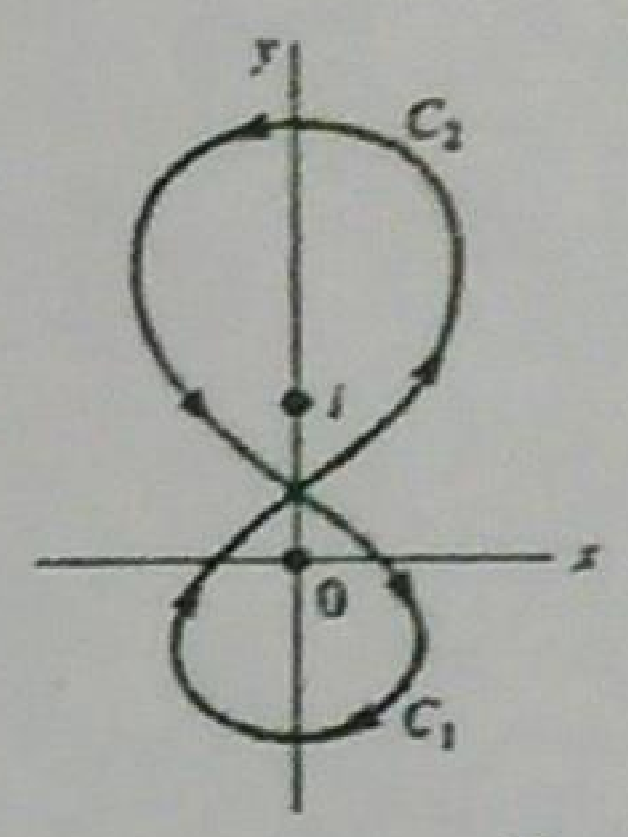
d) Verify $u(x,y)=x^3-3xy^2-5y$ is harmonic in the entire complex plane. Then find the conjugate harmonic function of u. 5 Marks

Problem number (2) (25 Marks)

a) Evaluate the integrals: 1) $\int_C e^z dz$ 2) $\int_C \frac{1}{z^2} dz$ 5 Marks

where C is the ellipse $(x-2)^2+(y-5)^2/4=1$.

b) Evaluate $\int_C \frac{z^3+3}{z(z-i)^2} dz$,where C is shown as 5 Marks



c) Let C be the unit circle, for any real constant a, find the value of $\int_C \beta \frac{e^{az}}{z} dz$, 8 Marks

Then show that $\int_0^{\pi} e^{a\cos\theta} \cos(a\sin\theta) d\theta = \pi\beta$.

d) Evaluate the Cauchy principal value of $\int_{-\infty}^{\infty} \frac{1}{(x^2+1)(x^2+9)} dx$. 7 Marks

Problem number (3) (20 Marks)

a) Expand $f(z)=\frac{1}{z(z-1)}$ in a Laurent series valid for $1<|z-2|<2$. 10 Marks

b) Find the general solution of the following differential equation: 10 Marks

$$y''+(\cos x)y=0.$$

Problem number (4) (20 Marks)

a) Prove that $\int_0^a (\ln \frac{a}{x})^{\frac{-1}{2}} dx = a\sqrt{\pi}$. 5 Marks

b) Find the general solution of the following differential equations: 15 Marks

- $x^2y''+xy'+(\alpha^2x^2-v^2)y=0$.
- $xy''+3y'+9y=0$.

With my best wishes

Dr. Waheed Kamal Zahra

Question number (2): (20 Marks)

A) Assume the conduit shown in (Figure 3) has inside diameters of 12 in and 18 in at sections 1 and 2, respectively. If water is flowing in the conduit at a velocity of 16.6 ft/s at section 2. Find the following: (a) velocity at section 1, (b) volume flow rate at section 1, (c) volume flow rate at section 2, (d) weight flow rate, and (e) mass flow rate.

Given: Density of water ($\rho_w = 62.3 lb_m/ft^3$), acceleration of gravity ($g = 32 ft/s^2$)

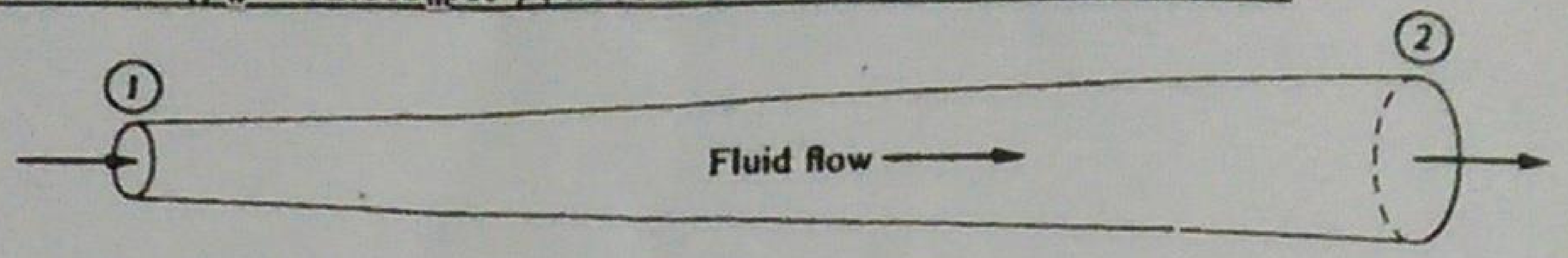


Figure 3

B) Calculate the surface tension if the pressure difference between the inside and outside of a soap bubble of 3mm diameter is 18 N/m^2.

C) Derive an expression for Euler's equation of motion for one dimensional non-viscous fluid flow.

Question number (3): (20 Marks)

A) Is the following equation dimensionally homogeneous?

$$a = 2d/t^2 - 2v_o/t$$

Where, a=acceleration, d =distance, v_o= velocity, and t = time.

B) Derive an expression for the Pressure variation due to elevation in a static fluid.

C) Write short notes (use clear drawings where relevant) about three different systems of measuring pressure.

Question number (4): (20 Marks)

A) A Venturi meter fitted in a 15 cm pipeline has a throat diameter of 7.5 cm (Shown in Figure 3). The pipe carries water, and a U-tube manometer mounted across the Venturi has a reading of 95.2 mm of mercury. Determine:

1. The pressure drop in Pascal's, indicated by the manometer
2. The ideal throat velocity (m/s)
3. The actual flow rate (l/s) if the meter C_d is 0.975.

Given: Density of water ($\rho_w = 1000 kg/m^3$)
[Density of mercury = 13600kg/m^3]

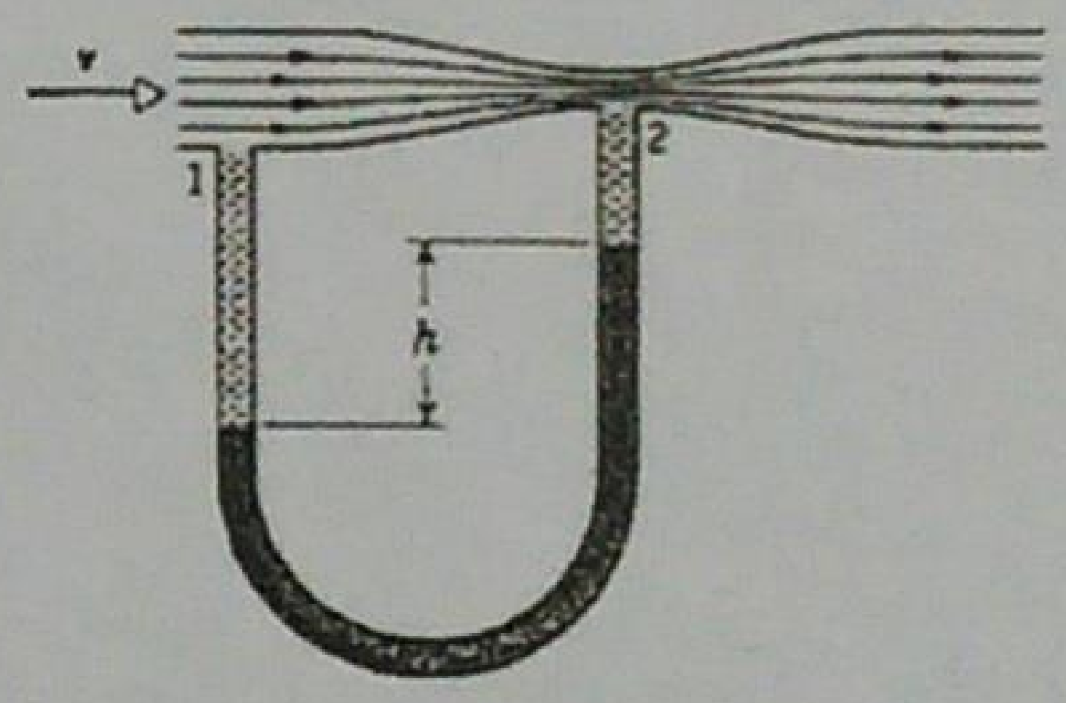


Figure 3

B) Describe the following expressions with short words (use clear drawings where relevant)

1- Reynolds Transport Theorem.
2- Vena Contracta
3- Fluid as a continuum.
4- Lagrangian Description of fluid motion.
5- Viscosity.
6- Specific Weight.
7- Absolute Pressure.
8- Centre of Buoyancy
9- Streak Line.
10- Velocity Field.

End of Questions............انتهت الاسئلة

With Best Wishes........ مع اطيب التمنيات بالنجاح و التوفيق

دكتور مهندس / ماهر علم الدين محمد بسطويسي

Tanta University

Department: Mechanical Power Engineering

Total Marks: 90 Marks

Faculty of Engineering

Course Title: Fluid Mechanics (1) A

Date: Jan 22th 2013 (First Term)

Course Code : MEP 2103

Allowed Time : 3hrs

No. of Pages: (2)

Year :2nd Mechanical Power Engineering

Remarks: (Answer all the following questions, Assume any missing data)

Question number (1): (30 Marks)

A) Consider a glass container, half-full of water and half-full of air, at rest on a laboratory table (Shown in Figure 1). List some similarities and differences between the liquid (water) and the gas (air).

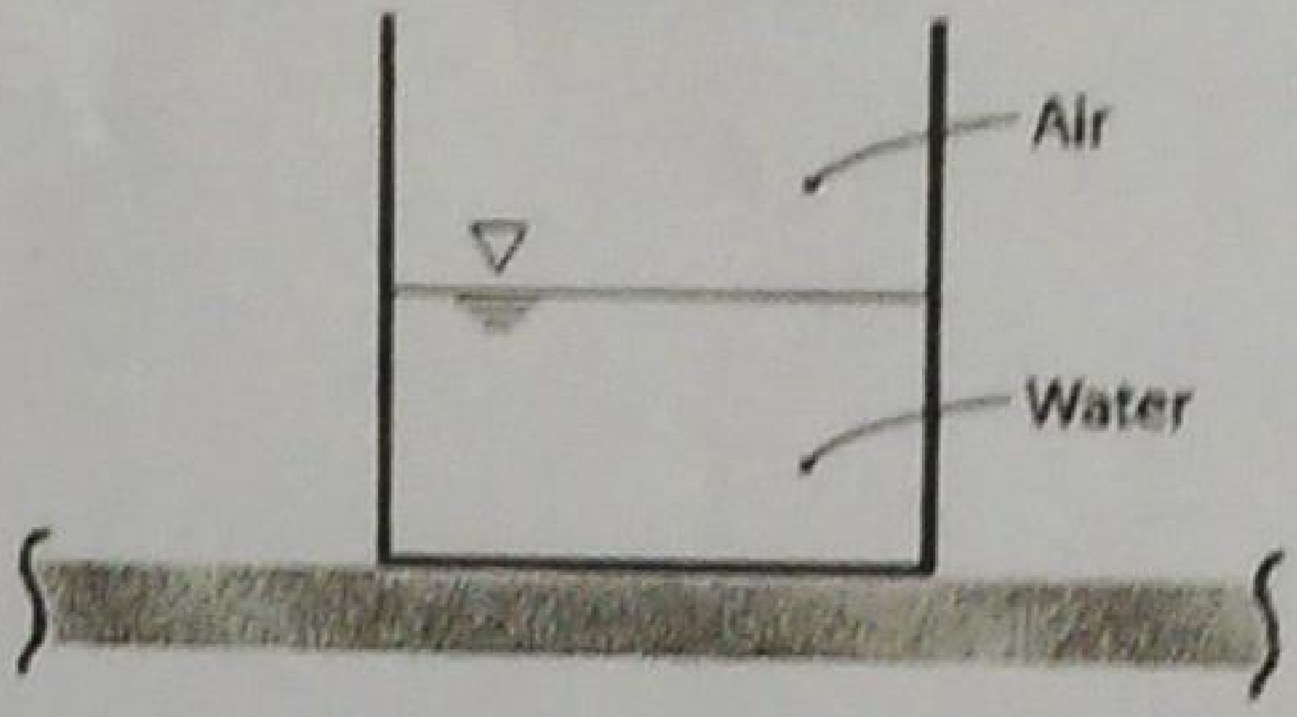


Figure 1

B) Density of sea water at the surface was measured as 1040 kg/m^3 at an atmospheric pressure of 1 bar. At certain depth in water, the density was found to be 1055 kg/m^3. Determine the pressure at that point. Given: The bulk modulus is 2290×10^6 N/m^2.

C) Mark the following statements with true or false:

1- Poise is the unit used to measure the density and it equals 0.1 Ns/m^2 .
2- Bulk modulus of gases depends on the process law for the change in volume and it is different for different processes.
3- All liquids exhibit a free surface known as meniscus when it is in contact with vapor or gas.
4- Even though Bernoulli's equation is derived for inviscid fluids, it provides a good estimation for real fluids when the viscosity is small.
5- Dilatant fluids exhibit a decrease in viscosity with increasing shear stress.
6- A solid deforms continuously under the action of shear force, however small.

D) A tank 20 ft deep and 7 ft wide is layered with 8 ft of oil, 6 ft of water, and 4 ft of mercury (Shown in Figure 2). Compute the total hydrostatic force.

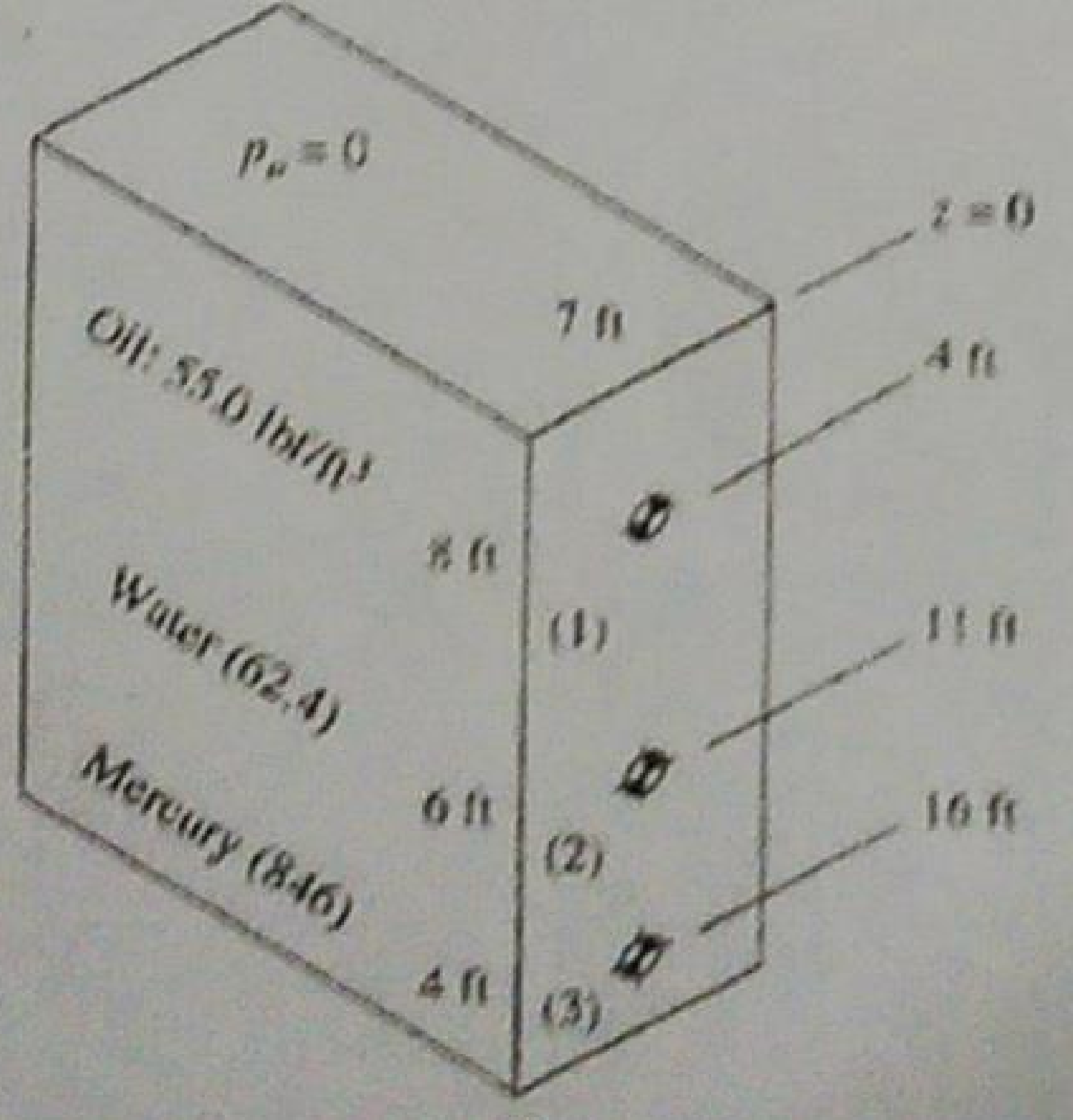


Figure 2

Exam in Two Pages, and Four Questions

Tanta University
Faculty of Engineering
Prod.Eng.&Mech. Design Dept.

Theory of Machines
Year : 2nd Year(Pr+Pn)
Time: 3 Hours

--------------------------------------24-01-2013--------------------------------------

Answer All The Questions With Neat Sketches Whenever Possible:-

Q(1):- (15%)

(a) Define the following:-

(i) link or element. (ii) kinematic pair. (iii) mechanism. (iv) machine. (v) structure. (vi) mechanics. (vii) mobility.

(b) What are quick return mechanisms? Where are they used? Sketch and explain the functioning of any one of them (and find time ratio?).

(c) Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain.

Q(2):- (15%)

(a) Explain how the velocities and accelerations of a slider and the connecting rod are obtained in a slider crank mechanism?.

(b) For the configuration of a slider crank mechanism shown in the following figure, find :- (i) The velocity and acceleration of slider at B.

(ii) The velocity and acceleration of point E.

(iii) The angular acceleration of link AB.

The crank rotates at 20 rad/sec counter clock wise. Given: OA=480 mm; AB=1600 mm.

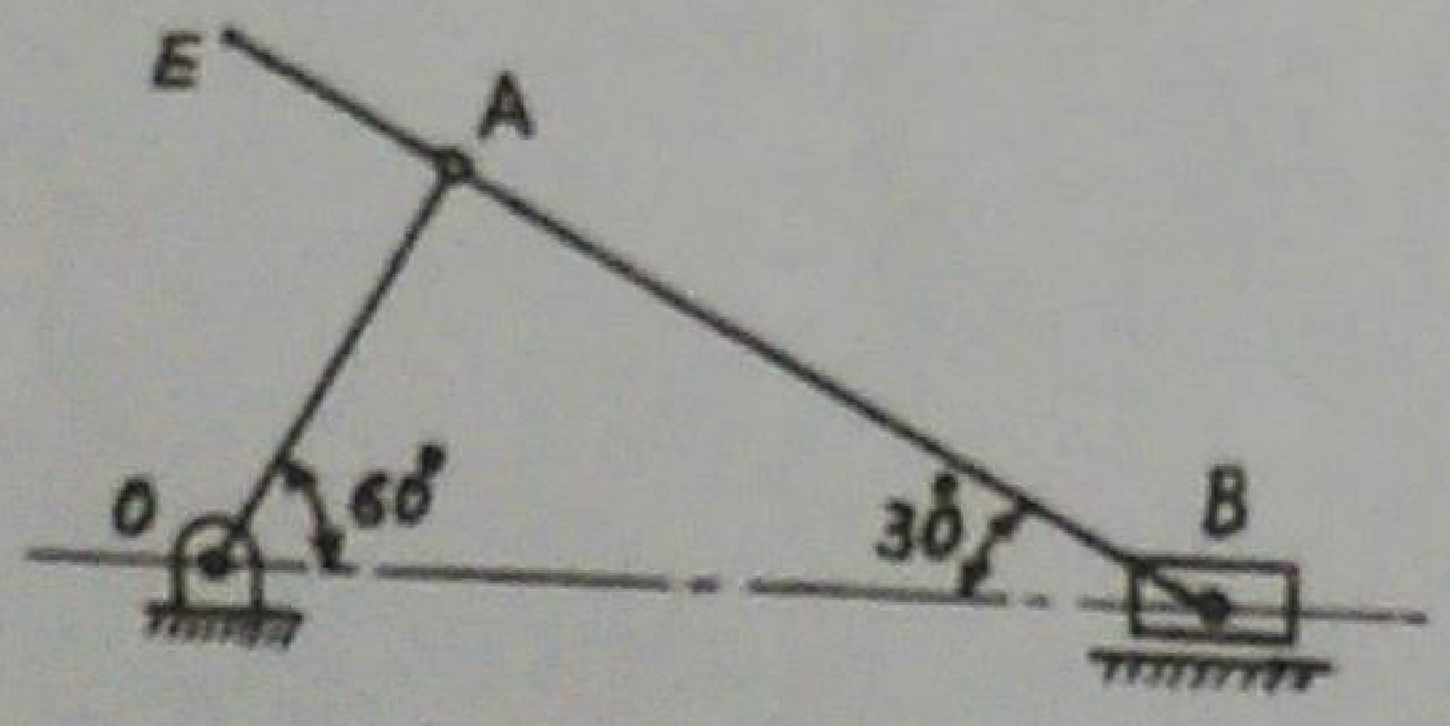


Fig.[Q(2)]

Q(3):- (15 %)

(a) Sketch an intermittent motion mechanism and explain its practical applications.

(b) In the mechanism shown in the following figure, the crank AB is 100 mm long and rotates uniformly clockwise at 30 rad/sec. Given that BC = 300 mm; BD = 150 mm; DE = 250 mm; EF = 200 mm; DG = 167 mm; angle CAB = 30°.

Find the following:-

(a) The velocity and acceleration of G for the configuration shown.

(b) The angular velocity and acceleration of the link DE.

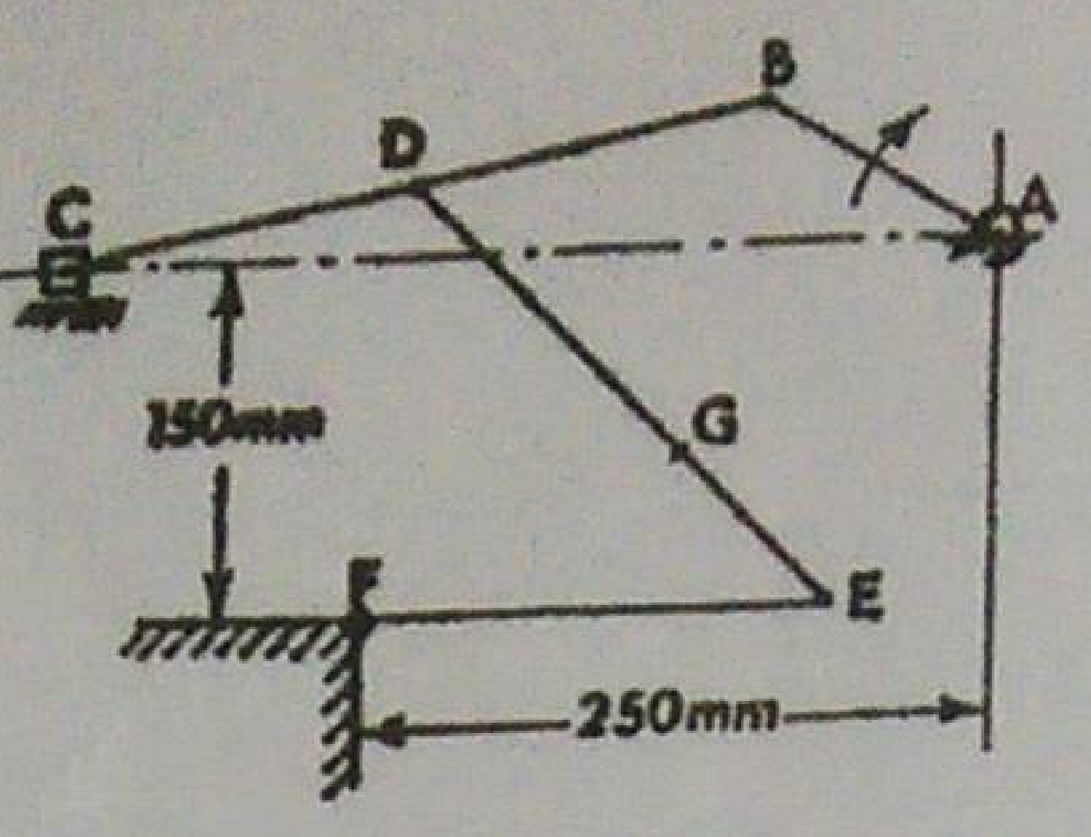


Fig.[Q3(b)]

Q(4):- (15%)

(a) Define the following:-

Module - Velocity ratio - Circular pitch - Diametral pitch - Base circle diameter - Pressure angle – involute – Normal pitch.

(b) State and prove the law of gearing of gearing. Show that involute profile satisfies the conditions for correct gearing.

(c) A shaft running at 2000 rpm from an electric motor carries the first gear wheel ($T_1 = 18$ teeth). The second shaft was the second to the first gear box and the input to the second gear box (which has four spur gears). The fourth shaft in the second gear box carries output pulley which has diameter 500 mm and runs with linear velocity 3 mt/sec. Find the suitable teeth numbers and the dimensions of gears, if module m=4mm.

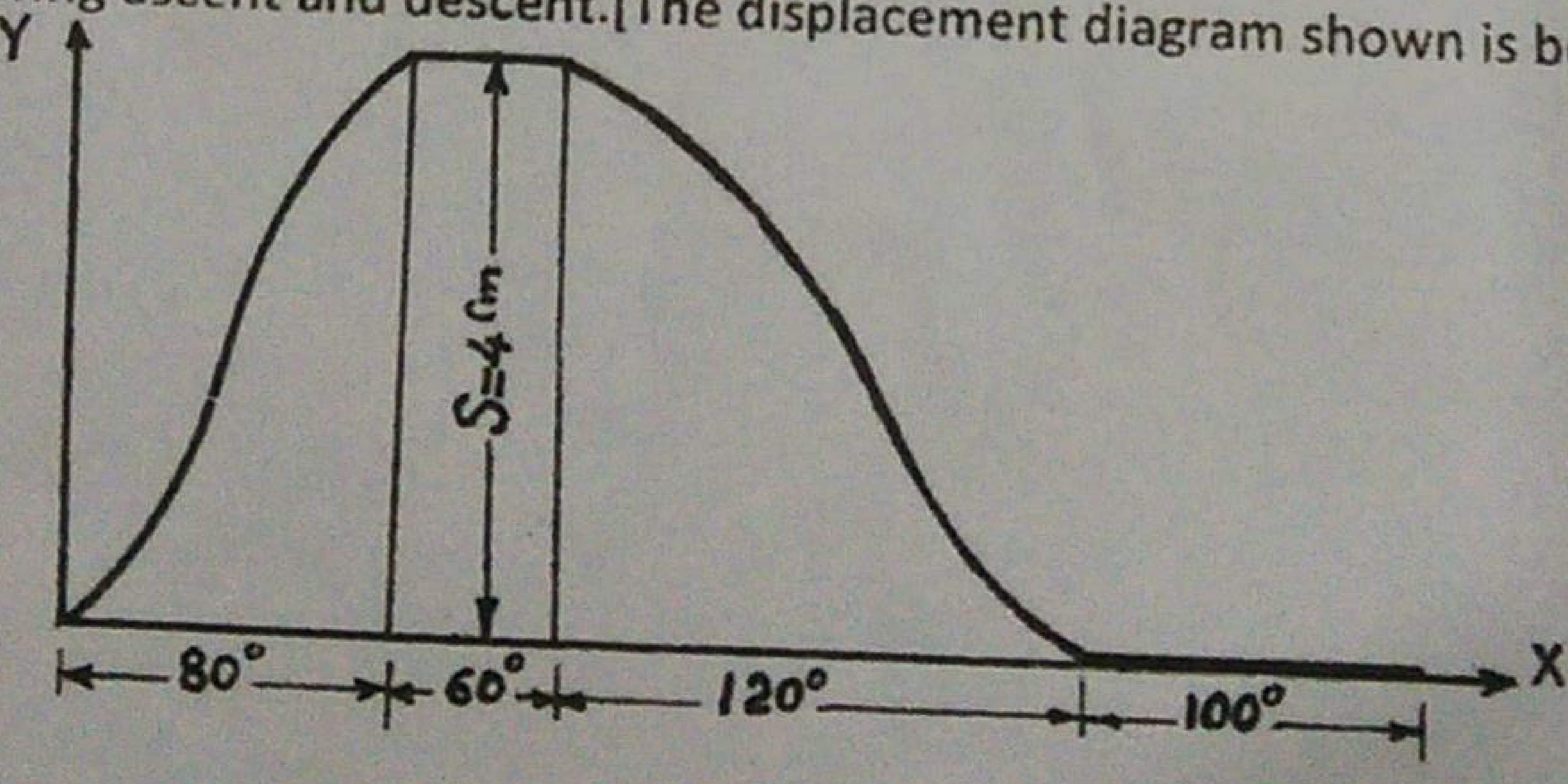
Q(5):- (15%)

(a) Write short notes on the cams and followers? Explain with sketches the different types of cams and followers.

(b) With the data given below the follower moves with uniform acceleration/ retardation during ascent and with S.H.M. during descent. Draw the cam profile.

..Least radius of the cam = 3 cm.
..Angle of ascent = 80°.
..Angle of dwell between ascent and descen = 60°.
..Angle of descent = 120°.
..Lift of the follower = 4 cm.
..Offset of the roller = 1.5 cm.

If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during ascent and descent.[The displacement diagram shown is below]..



Q(6):- (10%)

(a) Figure[Q6(a)] shows the layout of a quick return mechanism of the oscillating link type, for a special purpose machine. The driving crank BC is 30 mm long and time ratio of the working stroke to the return stroke is to be 1.7. If the length of the working stroke of R is 120 mm, determine the dimensions of AC and AR, find the number of degrees of freedom.

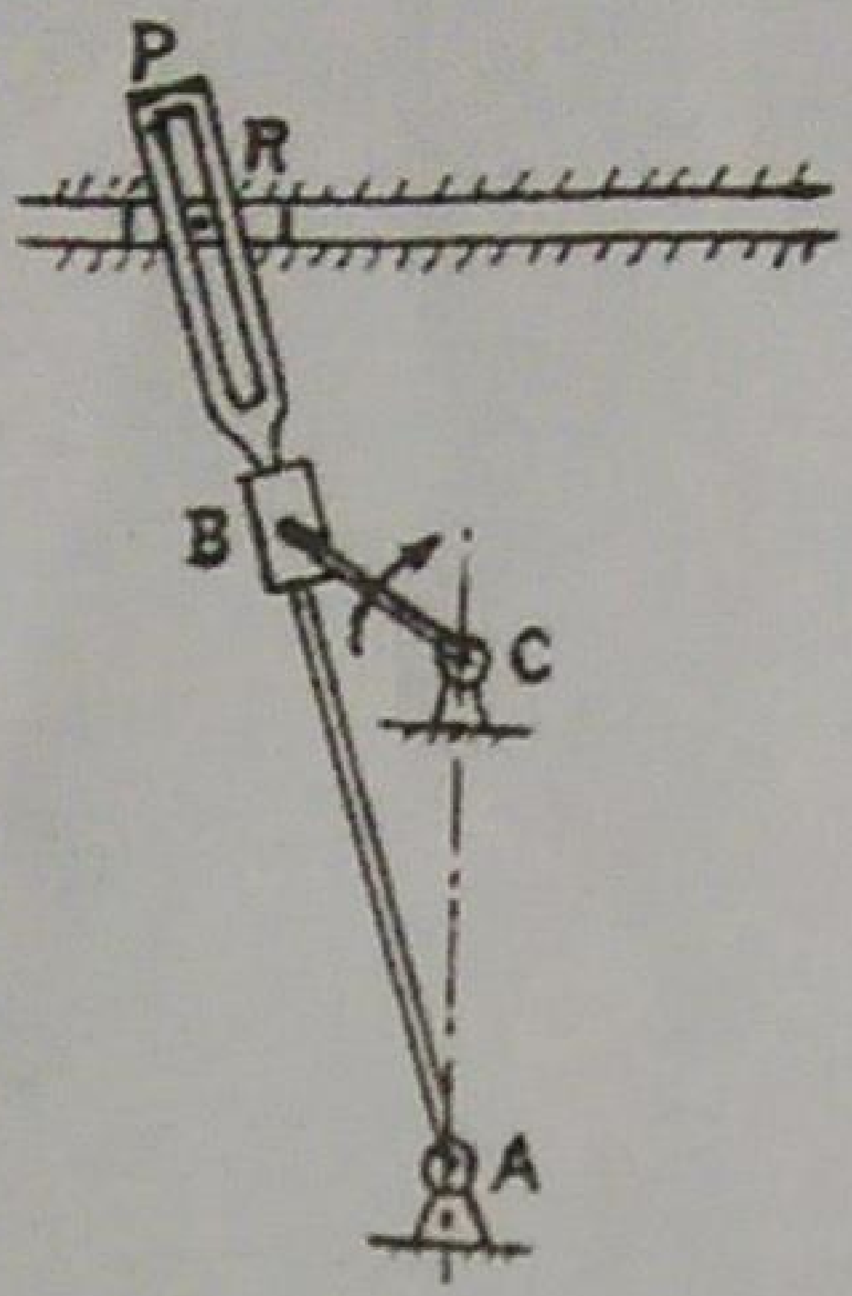


Fig.[Q6(a)]

(b) Define the flywheel? What is its function? What is the coefficient of fluctuation?.

(c) From the figure [Q6(b)] draw graphically the pass of point M .

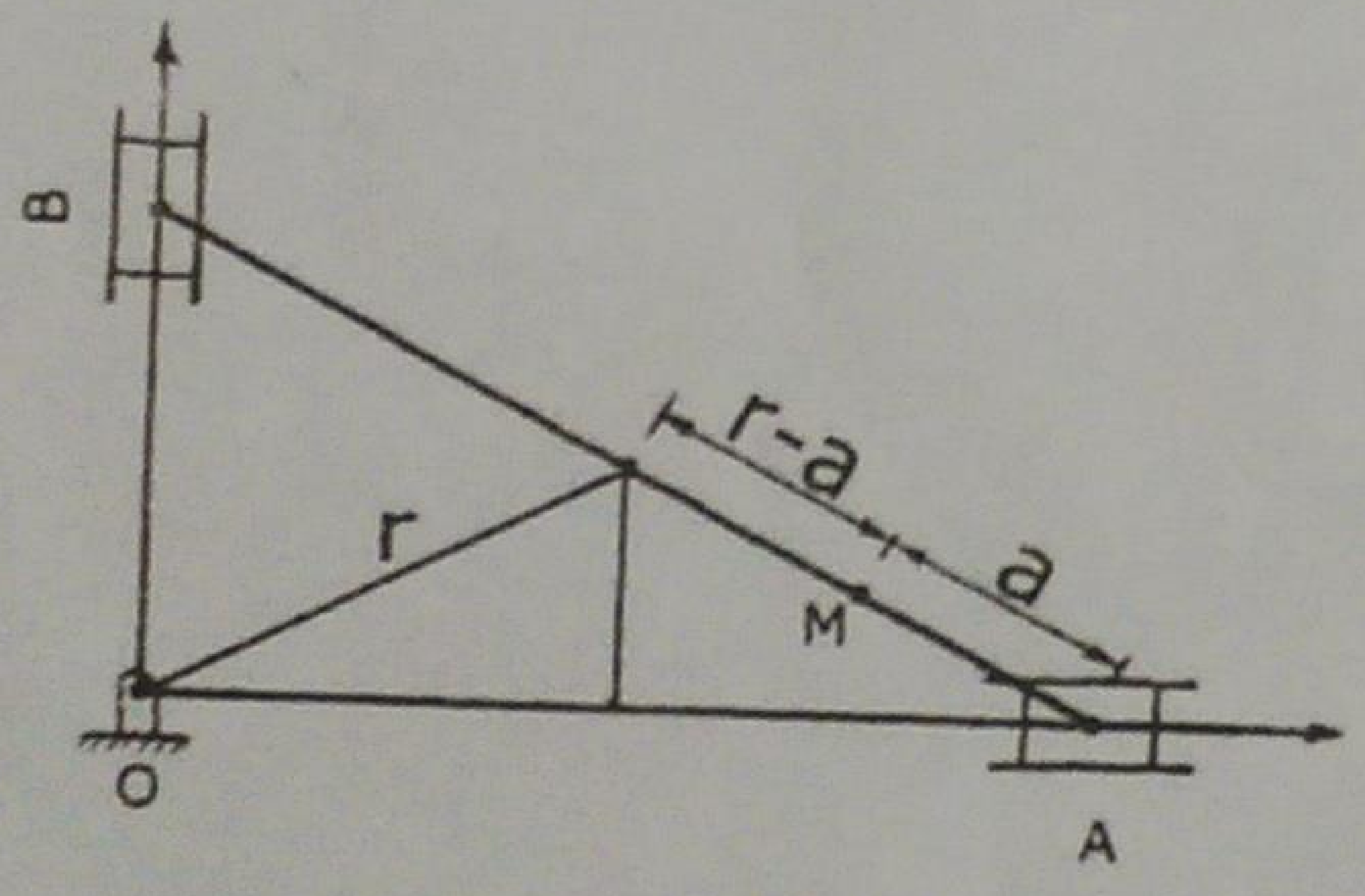


Fig.[Q6(c)]

... (((With My Best Wishes)))...

بسم الله الرحمن الرحيم

جامعة طنطا
كلية الهندسة
الفرقة الثانية

الفصل الدراسي الأول ٢٠١٢/٢٠١٣
ميكانيكا قوى

المادة : تصميم ماكينات
التاريخ : ٢٠/١/٢٠١٣
الزمن : ٣ ساعات

Answer the following questions :

(1) - A thick walled closed-end cylinder is made of an Al-alloy has inside diameter of 200 mm and outside diameter of 800 mm. The cylinder is subjected to an interval fluid pressure of 150 MPa. Determine the principal stresses and maximum shear stress at a point on the inside surface of the cylinder. Also determine the increase in inside diameter due to fluid pressure ، where $(E = 72 \text{ GPa} ، \mu = 0.33)$.

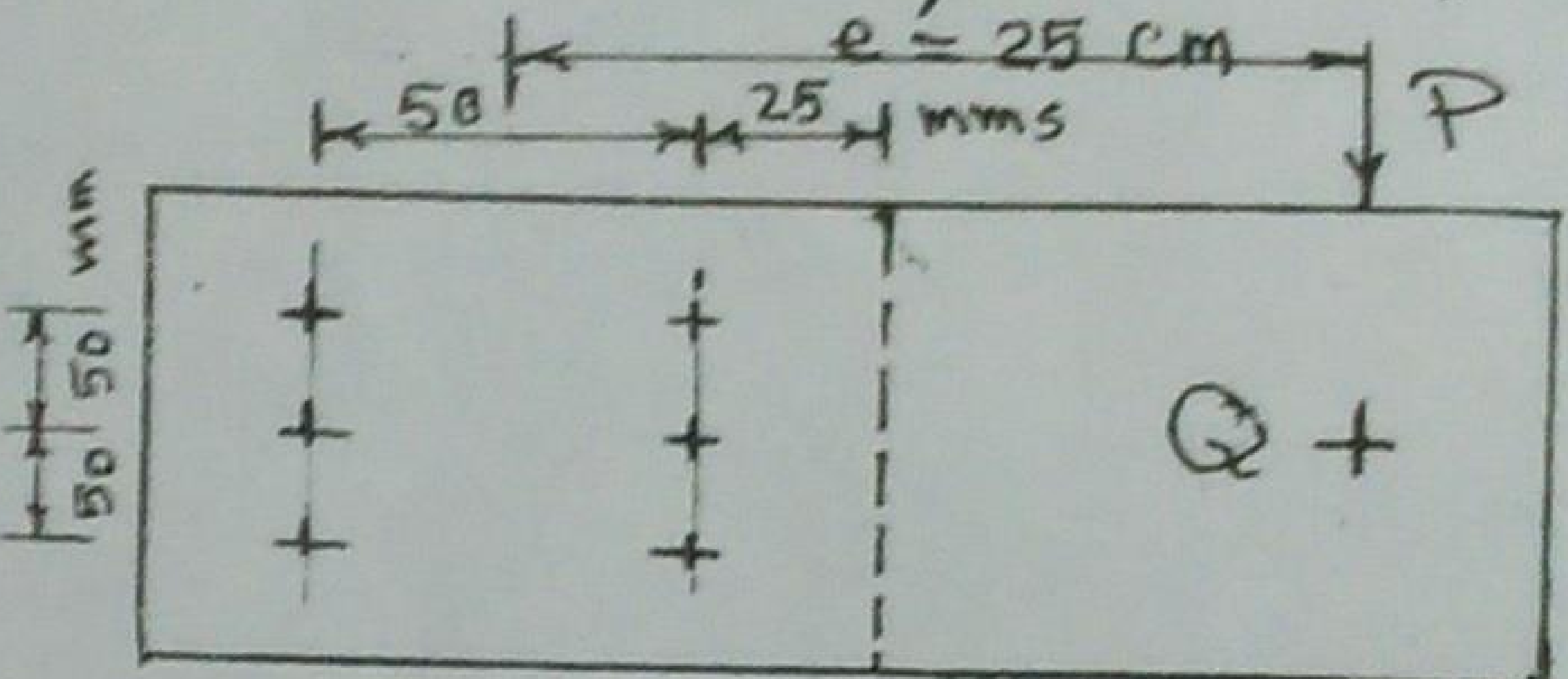


Fig. (1)

(2) - An eccentrically load lap riveted joint is to be designed for a steel bracket as shown in Fig. (1). The bracket is 10 mms thick. All rivets are to be the same size. The loads on the bracket are P = 1200 Kgs and Q = − 900 Kgs. The rivets spacing is C = 50 mms, load arm e = 25 cms. Determine the size of the rivets to be used for the joint where the permissble stresses are as follows: $\tau_{all.} = 1400$ Kgs/cm² ، $\sigma_{all.} = 3400$ Kgs/cm².

(3) - A bracket as shown in Fig. (2) Carries a load of 10 KN. Find the size of the weld if the allowable shear stress is not exceed 80 N/mm².

$$I_G = t\ell(3b^2 + \ell^2)/6$$

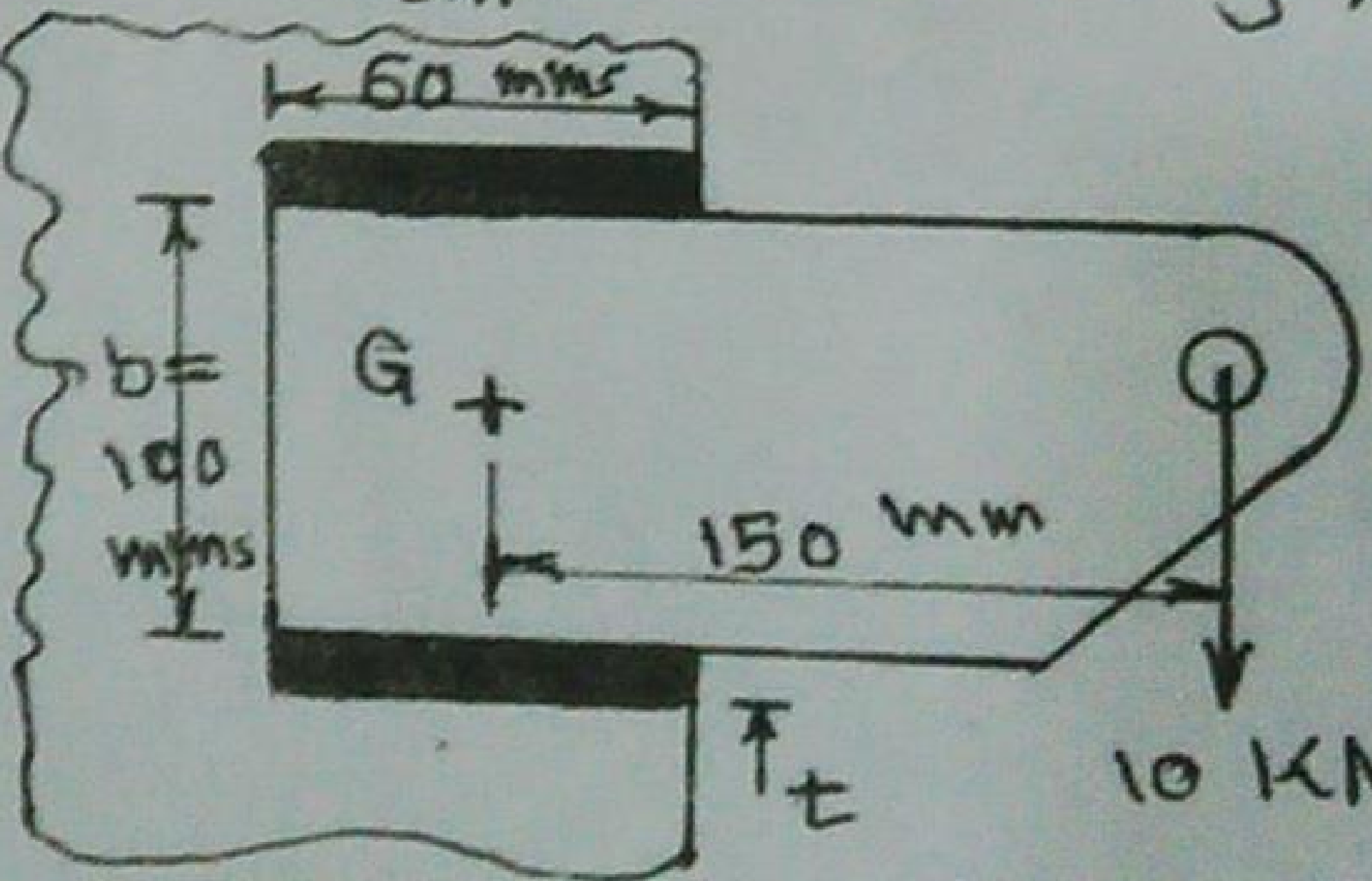


Fig. (2)

انظر خلفه

(4) - A flat belt has an elastomer envelope, is 200 mm wide & and transmits 60 KW at a belt speed of 5 m/s. The belt is used crossed configuration to connect a 300 mm driving pulley to a 900 mm diameter driven pulley at a shaft spacing of 6 m.

a - Calculate the belt tension based on a coefficient of friction of 0.38.

b - Calculate the minimum belt thick if the allowable stress on the belt is 16 Kgs/cm^2.

c - Compute the belt length and the angles of wrap.

(5) - A beam ABCD is subjected to loads 50 KN & 25 KN as shown in Fig. (3). Determine the deflection at point D and determine also the position of maximum deflection of the beam between point B and point C.

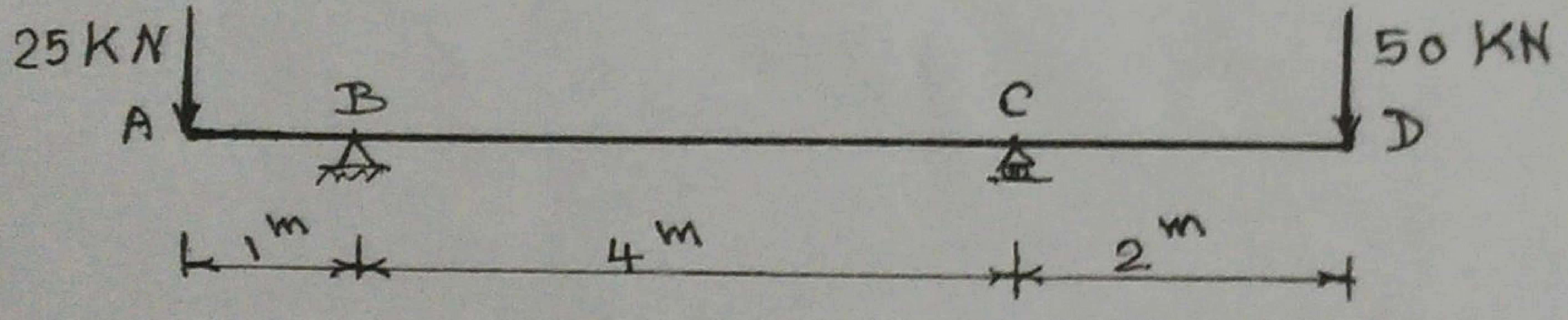


Fig (3)

End of questions

2/2 Good Luck

Dr. H. Hendawy

جامعة طنطا- كلية الهندسة

قسم هندسة القوى الميكانيكية	الفصل الدراسي: الأول	العام الجامعي: 2012 /2013
الفرقة: الثانية	النظام: لائحة جديدة / أسم المقرر: اقتصاد هندسي	كود المقرر:MEP21H5
التاريخ: 13-1-2013	عدد الصفحات: 1 / النهاية العظمى: 50 درجة	زمن الامتحان: ساعتان

ملاحظات: أجب على جميع الأسئلة

السؤال الأول (10 درجة)

1- اشرح عناصر إقامة منشاة صناعية ثم ارسم شكلا يوضح دائرة الإنتاج

2- اقترض شخص من المصرف قرض بفائدة بسيطة مقدارها 10% على أن يتم السداد خلال ثلاث سنوات وكان أجمالي المبلغ الذي سيتم سدادة 3600 $ اوجد:

1- قيمة القرض إذا كان سداد القرض على أقساط متساوية من الأصل بالإضافة إلى فائدة الرصيد

2- قيمة القرض إذا كان سداد القرض في نهاية المدة مع سداد الفوائد بشكل دوري خلال مدة القرض

السؤال الثاني (10 درجة)

تبلغ التكاليف السنوية الثابتة لمصنع $4.8*10^6$L.E/year و تبلغ التكاليف المتغيرة 3 L.E/unit كمية الإنتاج عند نقطة التعادل 10^6*
2.4 unit/year أوجد: رياضيا

1- كمية الإنتاج عند نقطة التعادل إذا تم تخفيض التكاليف المتغيرة للوحدة بمقدار 20% مع إبقاء التكاليف الثابتة كما هي

2- كمية الإنتاج عند نقطة التعادل إذا تم تخفيض التكاليف الثابتة بمقدار 20% مع إبقاء التكاليف المتغيرة للوحدة كما هي

السؤال الثالث (15 درجة)

1- اذكر فوائد حساب التكاليف لمؤسسة صناعية

2- أذا أعطيت البيانات التالية لعناصر التكاليف للآلة ما

ثمن شراء الآلة 30000 LE والعمر الاقتصادي 10 سنوات وسعر الخردة 5000 LE وساعات التشغيل القياسية 2000 hr وساعات التشغيل الفعلية تقل بمعدل 3% ابتداء من السنة الأولى و الفائدة 12% و ضريبة الملكية 2% و التامين 3% وتكاليف إيجار معدة من نفس النوع 40 LE/hr ومعدل الزيادة في أسعار المعدات 6% ومعدل انخفاض القيمة الشرائية للعملة 3% وتكاليف التشغيل السنوية للسنة الأولى 450 LE وللسنة الثانية 550 LE استخدام طريقة القسط المتزايد لحساب قسط الإهلاك.

احسب التكاليف السنوية الكلية لكل ساعة تشغيل في للسنة الأولى والثانية

السؤال الرابع(15 درجة)

3- تكلم عن أنواع الإهلاك للمعدات

مصنع ينتج ثلاثة منتجات 1-2-3 وكانت عناصر التكاليف السنوية كالأتي:

المنتجات	1	2	3	
تكاليف المواد الخام	1300	1500	2000	دينار
تكاليف أجور العمالة	1000	1200	1800	دينار
كمية الإنتاج	600	800	1200	وحدة
عدد ساعات التشغيل	300	500	650	ساعة

إذا كان تكلفة القطعة الواحدة من المنتج الأول 6.18LE عن طريق تحميل المصروفات العامة على أساس تكاليف المواد الخام اوجد:

1- مجموع المصروفات العامة السنوية لهذه الشركة

2- تكلفة القطعة الواحدة من كل المنتج الثاني و الثالث عن طريق ساعات التشغيل

د/ السيد العجوز

مع أطيب التمنيات بالنجاح